

# Transpiration Demonstration Labs

## I. Water Loss From Transpiration

We have learned how trees lose water through transpiration. This exercise will allow us to observe the amount of water trees lose during the day through transpiration. It is best to do this activity when the weather forecast does not call for rain!

### *Materials needed:*

- Plastic baggies
- Yarn or string
- Live trees or shrubs in school yard
- Permanent marker
- 10 mL graduated cylinder
- Funnel



### *Lab activity:*

1. Each lab group gets six baggies and six pieces of yarn or string.
2. Each group should then select one tree or shrub to investigate.
3. Use a permanent marker to label the bags with your group name. Number the bags 1-6.
4. On the live tree or shrub, place the baggies over several leaves and tie the baggie *tightly* around the base of the leaves. The number of leaves in the baggie will depend on the tree or shrub selected. If the leaves are very big, one leaf in a bag should be sufficient. If a tree has small leaves, it is OK to include several leaves in the bag. However, make sure you place the same number of leaves in each bag.
5. Leave the bags overnight on the tree.
6. Collect the bags the next day during class.
7. Pour the water from the baggie through a funnel into a graduated cylinder and measure the amount of water in each of the six bags and calculate an average (add the six measurements together and divide by 6).
8. Students should estimate the number of leaves on a twig, the number of twigs on a branch, and the number of small branches on a large branch, and the number of large branches on the tree. REMEMBER THAT THIS DOES NOT HAVE TO BE EXACT. Do the best you can when estimating the number of branches and twigs.

#### **For example:**

The tree has about 20 large branches

each large branch has about 20 small branches

each small branch has about 10 twigs

each twig has about 5 leaves

Then:  $20 \times 20 \times 10 \times 5 = 20,000$  leaves on the tree (approximately)

9. Students can now estimate (very roughly) the amount of water lost by the entire tree during the 24-hour period.

Our example tree has approximately 20,000 leaves. To estimate the amount of water lost by the tree, divide 20,000 by the number of leaves that were in each baggie. For instance, if there were two leaves in each bag then  $20,000 / 2 = 10,000$

Now multiply the average water loss of the six test baggies by that number (in this case 10,000). This is the estimated water loss for the tree in the last 24 hours.

10. Compare results between different groups.

## II. Water Transport through a Carnation

Before water evaporates from leaves or flower petals, water is pulled up the stem of the plant through the xylem. In this experiment, you will observe the water transport through the xylem of a carnation.

### ***Materials needed:***

Fresh white carnations (celery also works)

Scissors

Food coloring (red or blue are best)

250 ml beakers, cups or vases



### ***Lab activity:***

1. Put one cup of water in a cup or vase and add at least 6 drops of food coloring. The water should turn the color of the food coloring.
2. Take a white long stemmed carnation (or celery) and cut the very bottom of the stem diagonally. This allows fresh plant tissue to transport the dye solution at a relatively fast rate.
3. Immediately place the carnation into the beaker of colored water and label the beaker with your group name and the date.
4. Allow 24 hours to pass before viewing results. The petals should turn the color of the food dye.
5. Note the patterns in the way the dye travelled through the flowers. Are the colored areas confined to certain areas of tissue in the flowers?
6. Cut a cross section of the carnation stem and observe the water transport system. What do you notice? Look closely at the arrangement of stained tissues in the stem.
7. Put a cross section of the stem under a dissection microscope in order to look closer at the xylem system.
8. Describe the results that you observe and briefly record your interpretation and conclusions.